

What is claimed is:

Subj 1
1. A voltage regulator of a vehicle AC generator including a rotor having a field coil and a plurality of magnetic poles and a stator having a stator core and an armature coil, said voltage regulator comprising:

a switching circuit for supplying field current to said field coil in a controlled manner;

a field voltage detecting circuit for detecting field voltage induced in said field coil when said field coil is not supplied with field current; and

a switch control circuit, connected to said field voltage detecting circuit, for controlling said switching circuit according to said field voltage.

2. The voltage regulator as claimed in claim 1, wherein

said field voltage detecting circuit comprises first means for providing said field voltage induced by residual magnetic flux of said stator core.

3. The voltage regulator as claimed in claim 1 wherein,

said switch control circuit comprises a second means for turning on said switching circuit when one of the frequency and voltage of said field voltage becomes as high as a predetermined value.

4. The voltage regulator as claimed in claim 2, wherein

said switch control circuit controls said switching circuit to regulate an output voltage of said AC generator when one of the frequency and voltage of said field voltage becomes as high as a predetermined value.

Subj 3
5. A voltage regulator of a vehicle AC generator including a rotor having a field coil and a plurality of magnetic poles and a stator having a stator core and an armature coil, said voltage regulator comprising:

a field current switching circuit connected to said field coil;

a control circuit, connected to said field voltage detecting circuit, for controlling said field current switching circuit according to an output voltage of said armature coil;

a power circuit for supplying electric power to said control circuit;

a power drive circuit for controlling supply of said electric power to said control

control circuit; and

first means for detecting rotation speed of said rotor;
wherein said power drive circuit supplies electric power from said power circuit to
said control circuit if said rotation speed becomes as high as a predetermined speed.

6. The voltage regulator as claimed in claim 5, wherein
said first means comprises said field coil and second means for detecting field
voltage induced in said field coil by residual magnetic flux of said stator core; and
said power drive circuit supplies electric power from said power circuit to said
control circuit for a predetermined duration after said field voltage becomes as high as a
predetermined voltage.

7. The voltage regulator as claimed in claim 5, wherein
said first means comprises a permanent-magnet-rotor fixed to said rotor and a pickup
coil; and
said power drive circuit supplies electric power from said power circuit to said
control circuit for a predetermined duration after output voltage of said pickup coil becomes
as high as a predetermined voltage.

8. The voltage regulator as claimed in claim 7, wherein
said power drive circuit further comprises a switch element connected to said power
circuit;
said first means further comprises a rectifier connected to said pickup coil for
providing DC voltage for controlling said switch element according to said DC voltage.

9. The voltage regulator as claimed in claim 7, wherein
said AC generator includes a rotor shaft, a pair of brushes disposed around said rotor
shaft and a pair of slip rings fixed to said rotor shaft to be in contact with said pair of brushes;
wherein
said permanent-magnet rotor is disposed adjacent said pair of slip rings in a resinous
mold member that is fixed to said rotor shaft.

10. The voltage regulator as claimed in claim 8, wherein

said pick-up coil is molded in a brush holder for holding said pair of brushes.

11. The voltage regulator as claimed in claim 5, wherein
said first means comprises a permanent-magnet-rotor and third means for providing
a binary signal according to rotation speed of said permanent-magnet-rotor; and
said power drive circuit supplies said electric power for a predetermined duration
initiated by said binary signal.

12. The voltage regulator as claimed in claim 5, wherein
said first means comprises a first set of a permanent-magnet-rotor and a pickup coil
and a second set of said field coil and second means for detecting field voltage induced in
said field coil by residual magnetic flux of said stator core;
third means for providing a first binary signal according to frequency of output
voltage of said permanent-magnet-rotor;
fourth means for providing a second binary signal according to frequency of said
field voltage;
fifth means for adjusting frequencies of said output voltage and said field voltage;
and
an OR circuit connected to said fourth means and said fifth means; wherein
said power drive circuit supplies said electric power for a predetermined duration
according to an output signal of said OR circuit.

13. The voltage regulator as claimed in claim 6, wherein
said power drive circuit further comprises a switch element for supplying electric
power from a battery to said power circuit.

14. The voltage regulator as claimed in claim 7, wherein
said permanent-magnet-rotor comprises a cylindrical magnet having a plurality of
magnetic poles on the peripheral surface thereof.

15. A voltage regulator of a vehicle AC generator including a rotor having a field
coil and a plurality of magnetic poles and a stator having a stator core and an armature coil,
said voltage regulator comprising:

a switching circuit for supplying field current to said field coil in a controlled
manner;

any corner : means for detecting rotation speed of said rotor when said field coil is not supplied with field current; and

a switch control circuit, connected to said field coil voltage detecting circuit, for providing said switching circuit with electric power to be supplied to said field coil when said detected rotation speed becomes as high as a predetermined speed.

16. The voltage regulator as claimed in claim 1, wherein
said means comprises first circuit means for providing field voltage induced in said field coil by residual magnetic flux of said stator core.

17. The voltage regulator as claimed in claim 15, wherein
said switch control circuit comprises:
a power circuit for supplying said electric power to said switch circuit;
a power drive circuit, connected to said means for detecting rotation speed, for supplying electric power from said power circuit to said switching circuit if said rotation speed becomes as high as a predetermined value.

18. The voltage regulator as claimed in claims 15, wherein said means comprises a permanent-magnet-rotor fixed to said rotor and a pickup coil.

19. The voltage regulator as claimed in claim 18,
said permanent-magnet rotor is disposed in a resinous mold member that is fixed to
said rotor.